



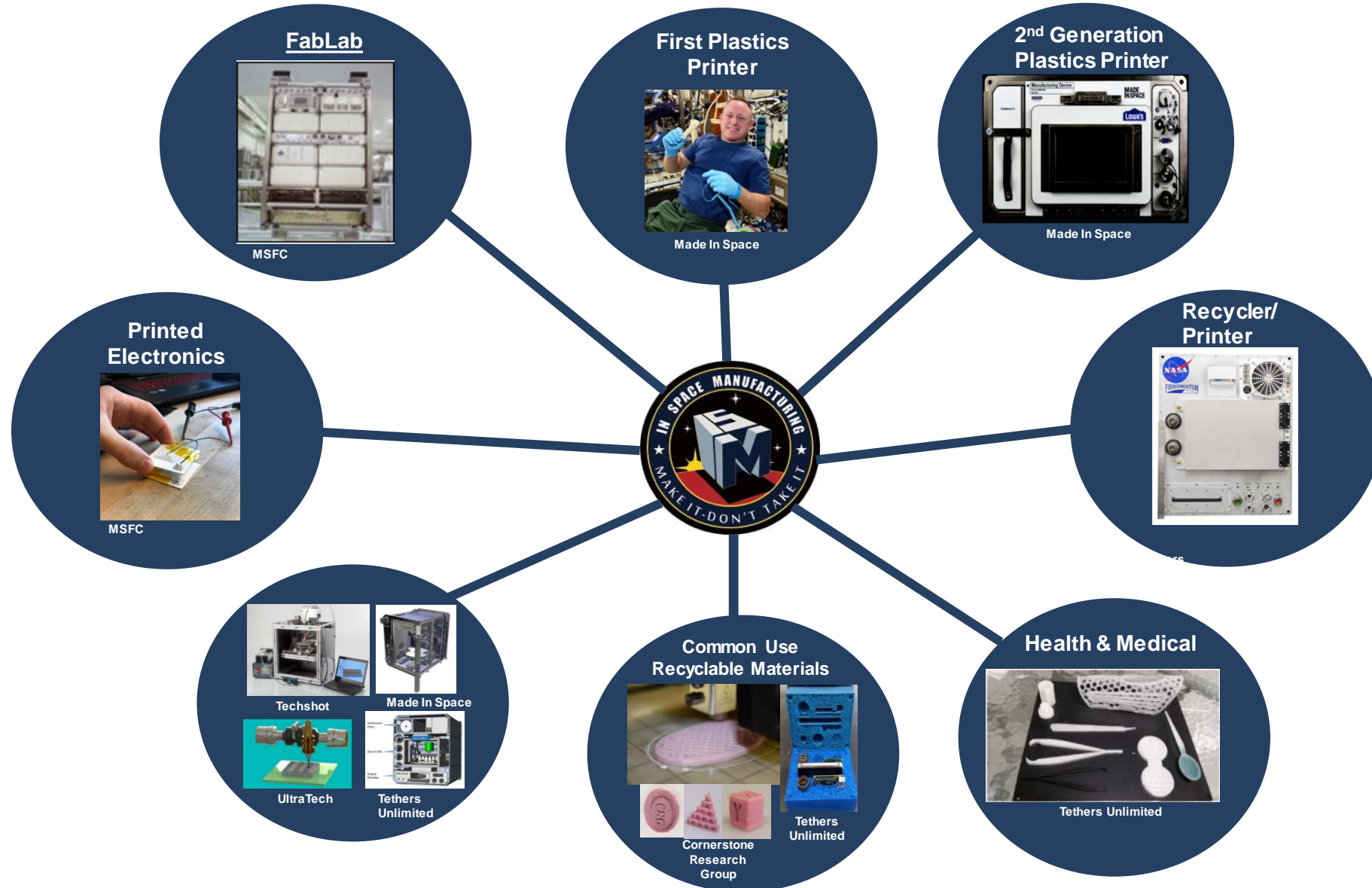
## Materials and Manufacturing: In Space and For Space

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**ISS R&D Conference**  
**July 29 – August 1, 2019**  
**Atlanta GA**

# In Space Manufacturing Path to Exploration

## Key Thrust Areas





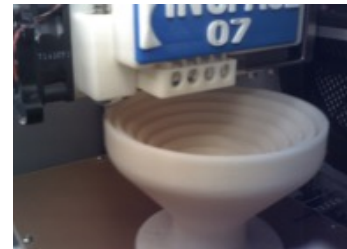


AMF on ISS with printed multi-purpose tool floating in front (photos courtesy of MIS)

- Additive Manufacturing Facility (AMF), the second generation printer, is a commercial, multi-user facility developed by Made in Space, Inc.
- Upgrades beyond 3DP include:
  - a) Print with multiple material (ABS, ULTEM 9085, and HDPE)
  - b) Integral cameras/sensors for automated monitoring
  - c) Maintenance procedures reduce crew time
  - d) Leveling and calibration with on-board systems
- Materials characterization task developing baseline mechanical properties on ABS (test matrix below)



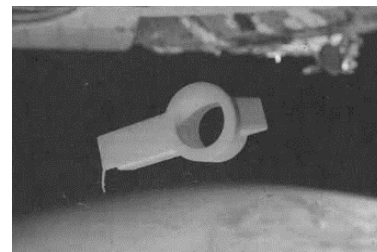
**SPHERES Tow Hitch**



**Antenna Feed Horn**



**REM Shield Enclosure**



**OGS AAA Adapter**

AMF Mechanical Property Test Matrix				
Type, Orientation	Qty (ground)	Quantity (flight)	ASTM #	Properties
Tension, 0	10	10	D638	Modulus, strength, strain, Poisson's
Tension, 90	10	10	D638	Modulus, strength, strain
Compression, 0	10	10	D695	Modulus, "strength," strain
Compression, 90	10	10	D695	Modulus, "strength," strain
Tension, +/-45 (shear)	10	10	D3518	Modulus, strength, strain, Poisson's
Flatwise tension	10	10	C297	z-direction (through-thickness) tensile strength
Range coupon	2	2	n/a	n/a
EMU fan cap	1	1	n/a	n/a
Total	63	63		



MIS CEO Andrew Rush with a demonstration of the ArchinautOne Solar array

## Objectives:

- Continue success of ESAMM and GBMASH to build ArchinautOne
  - Small satellite with best in class power capability
  - Operate in LEO
  - ESAMM unit will produce 2x 10 m beams which support 10 m<sup>2</sup> flexible solar panels each
  - Robotic arm will position vital components
  - In-situ V&V ensures quality product



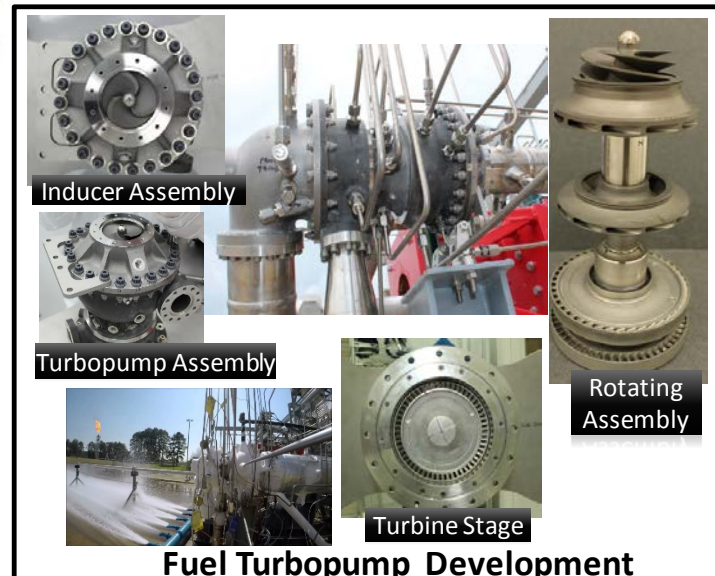
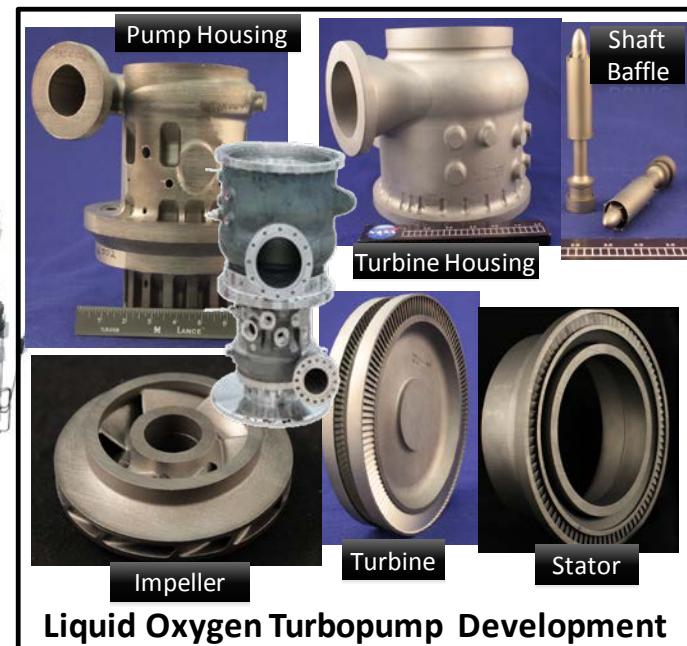
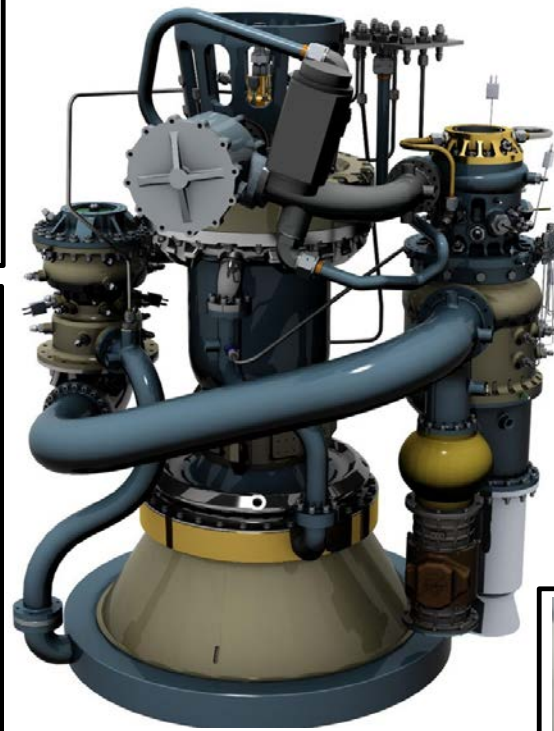
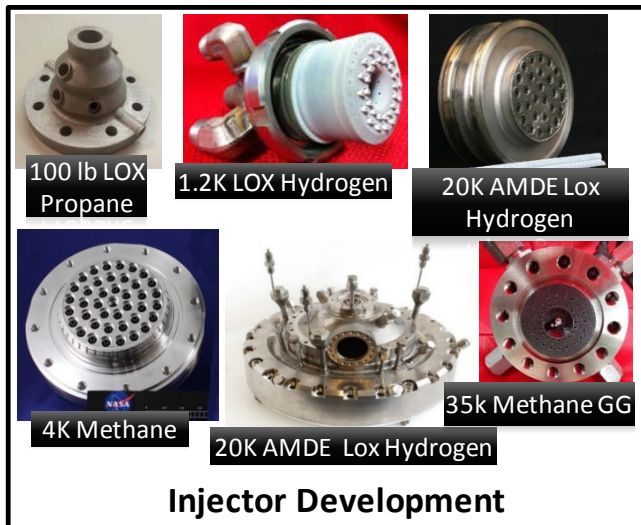
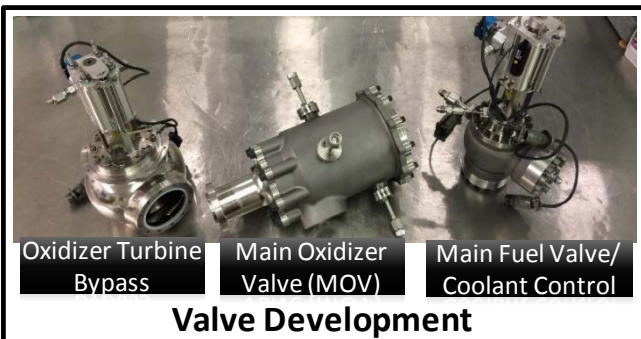
ArchinautOne Small Sat



ArchinautOne Small Sat with printed solar arrays

*Demonstration of small satellite with >2kW power*





# Rapid Analysis and Manufacturing Propulsion Technology (RAMPT) Thrust Chamber Concept

